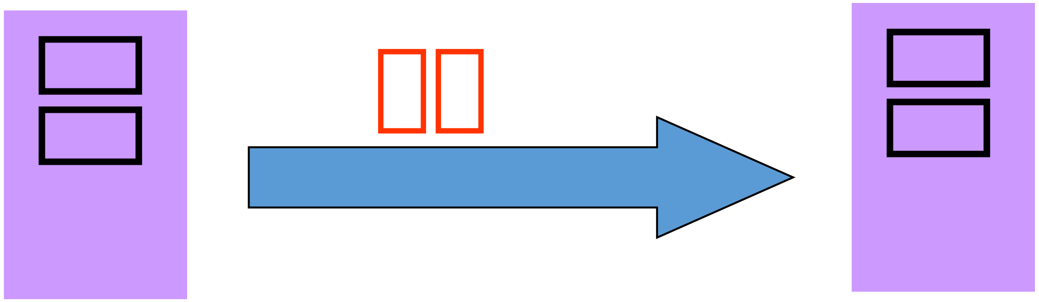
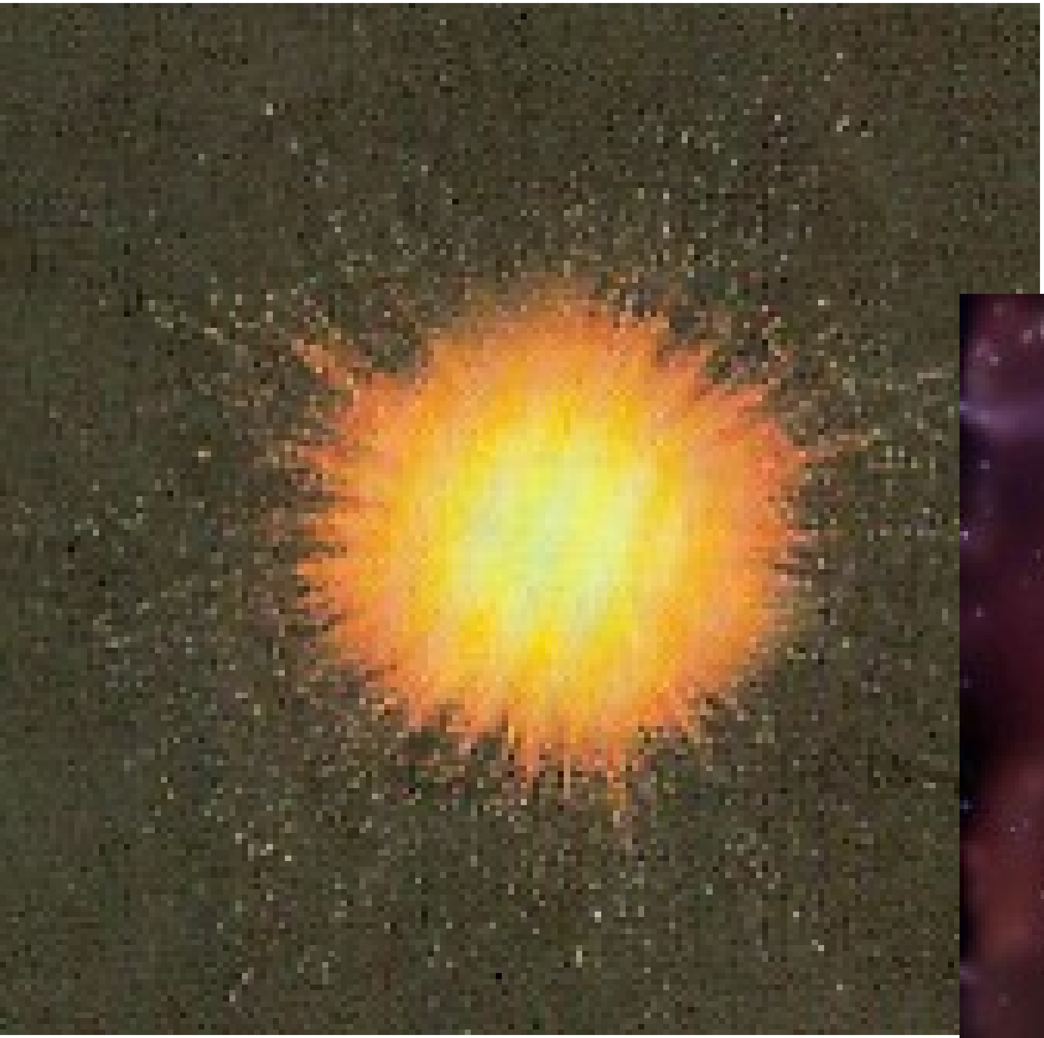
1

2



[illegible] [illegible]

[illegible] [illegible]



[illegible]—[illegible]

1. [illegible]

[illegible] → [illegible] → [illegible]（2h）→ [illegible] / [illegible] / [illegible] → [illegible] → [illegible]

① [illegible];

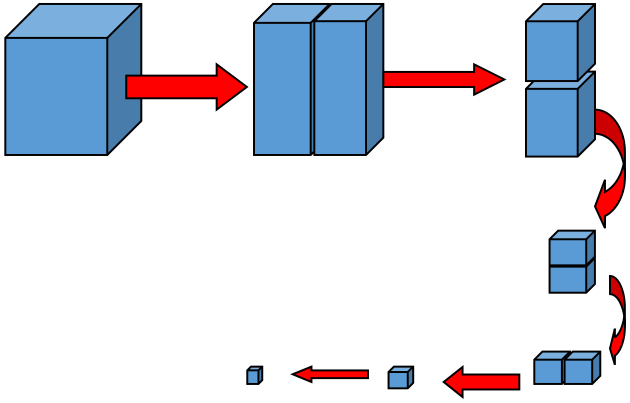
② [illegible];

③ [illegible] 22 [illegible]

2 [illegible]

[illegible] 1 [illegible]

[illegible]

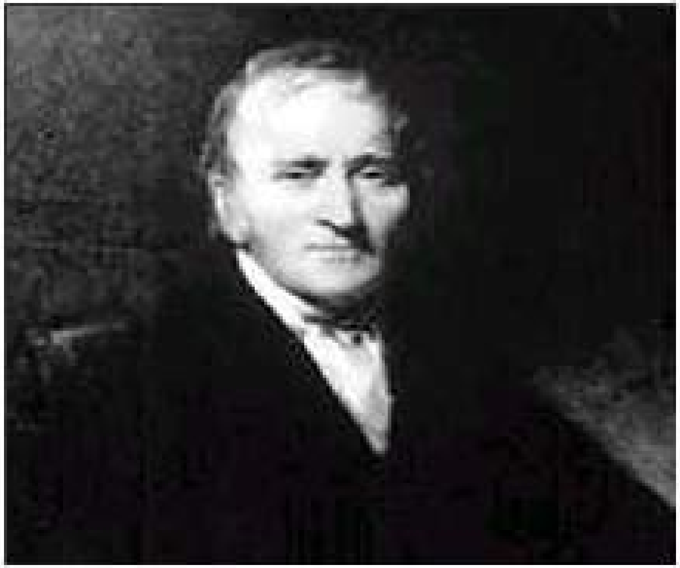


[illegible]

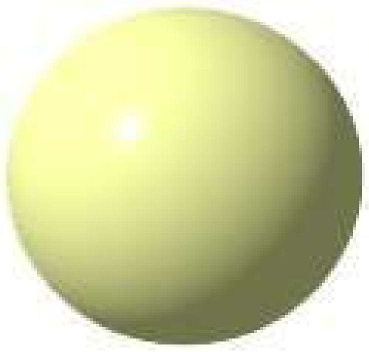
[illegible]

[illegible] Democritus [illegible] 460 [illegible]—[illegible] 370 [illegible]

2 (1803)



英国化学及物理学家
道尔顿 (J.Dalton)

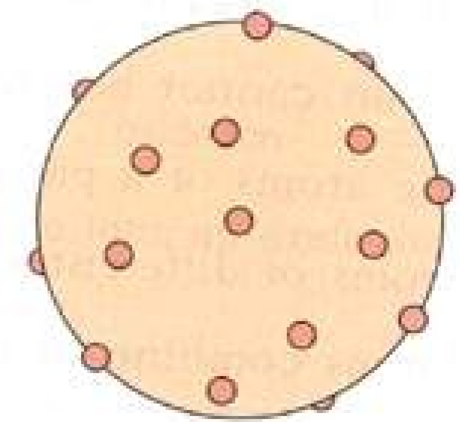


道尔顿原子模型

[illegible]3[illegible] (1904[illegible])

[illegible]

英国物理学家
汤姆生
(J. J. Thomson, 1856-1940)

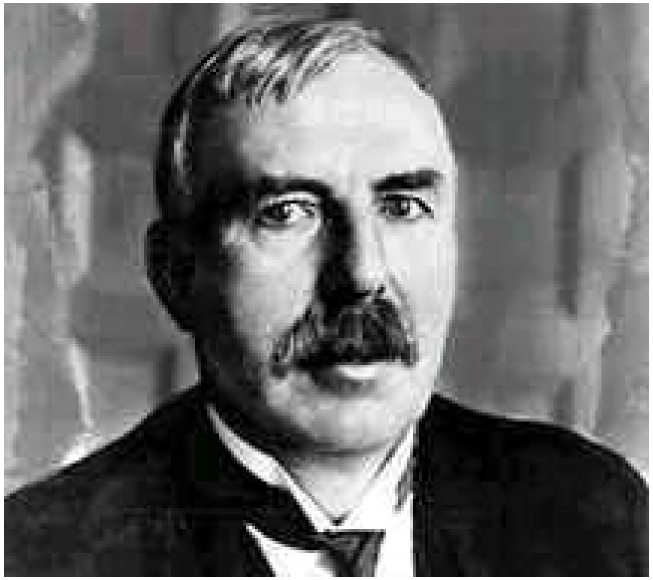


汤姆生原子模型
（枣糕模型）

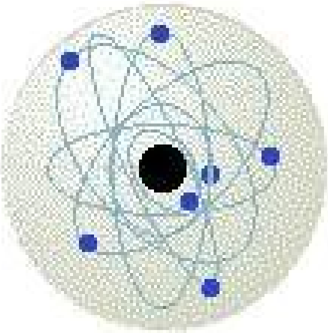
[illegible]“[illegible]”[illegible]
[illegible]

[illegible] 4 [illegible] (1911 [illegible])

[illegible]



英籍新西兰物理学家
卢瑟福
(E. Rutherford, 1871-1937)



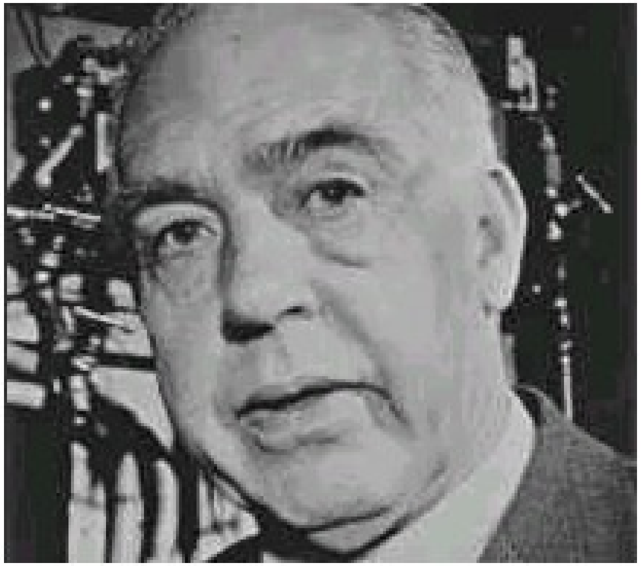
卢瑟福原子模型

(“[illegible]”[illegible])

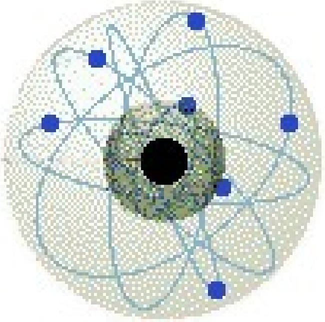
([illegible])

[illegible] 5 [illegible] (1913 [illegible])

[illegible]



丹麦物理学家
波尔 (N. Bohr, 1885-1962)



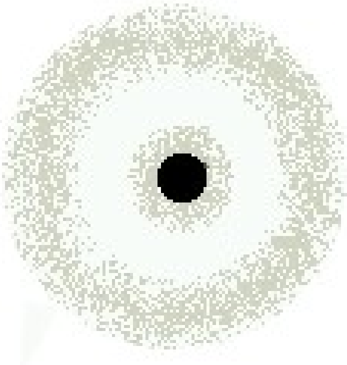
波尔的原子结构模型

([illegible])

□6□□□□□□(1926□)

□□□□□□□□□□□□□□□□

奥地利物理学家
薛定谔
(E. Schrodinger, 1887-1961)



电子云模型

(□□□□□□)

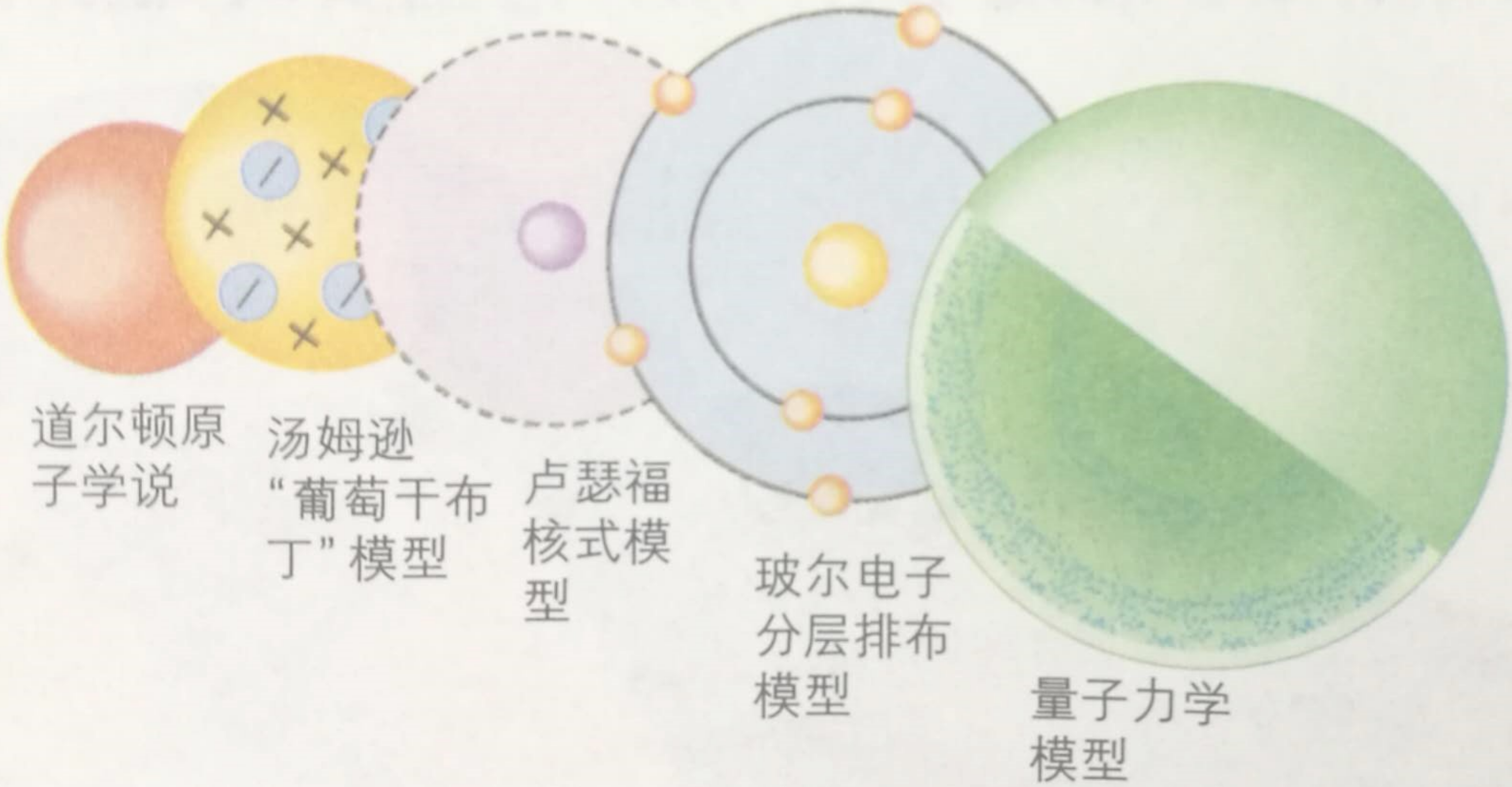


图 1–1–1　不同时期的原子结构模型

[illegible]

[illegible]

[illegible]

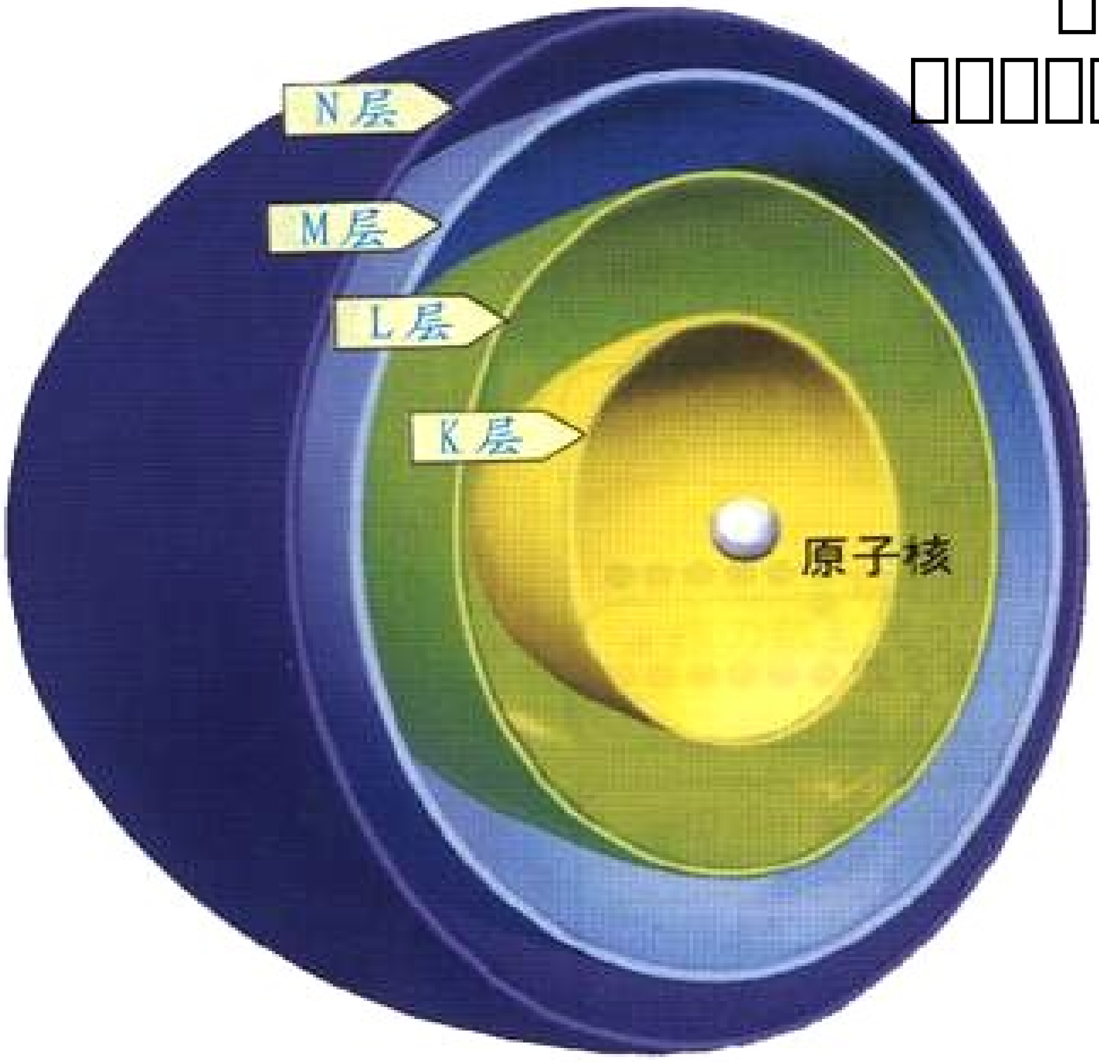
[illegible] (+)

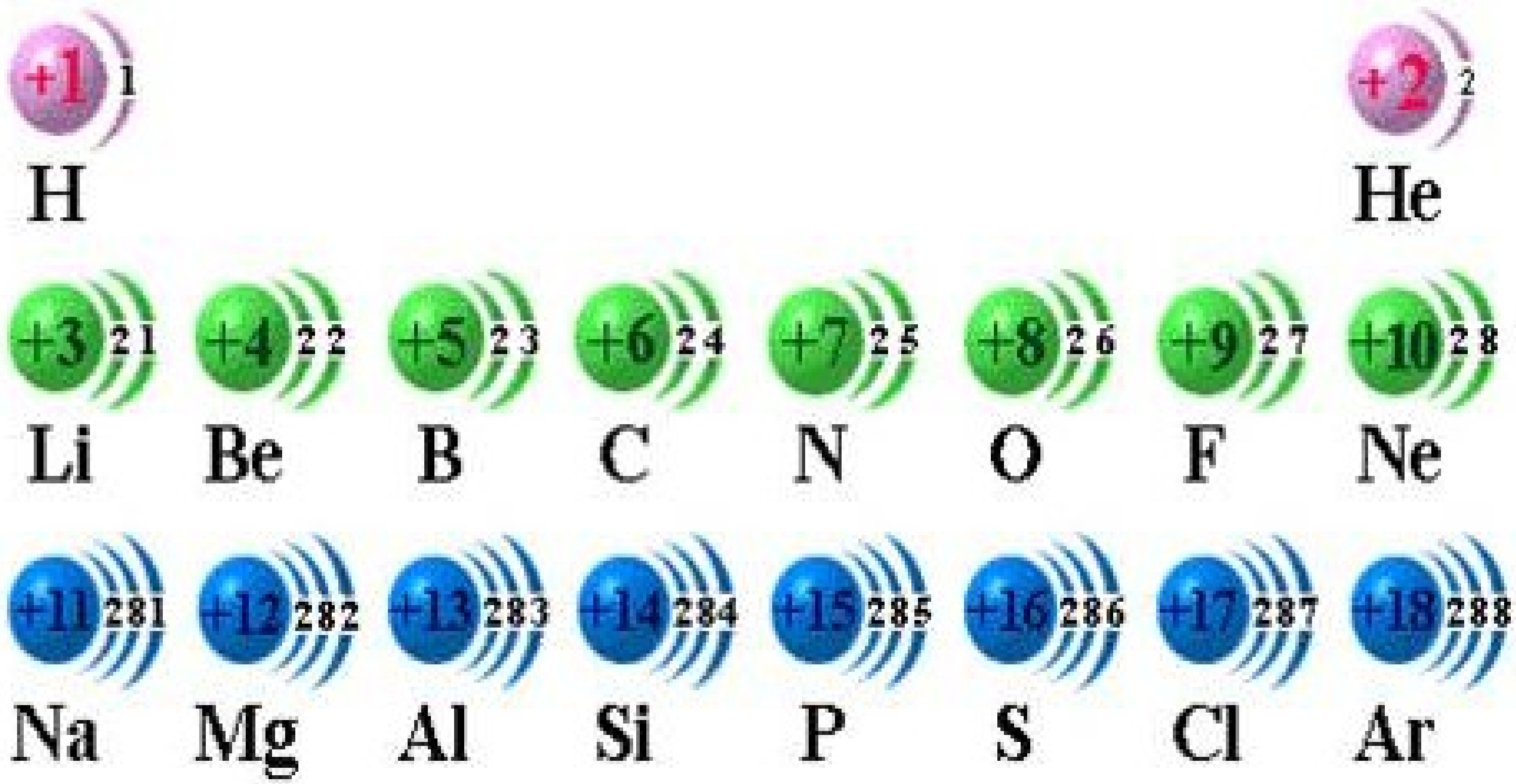
[illegible]

[illegible] ([illegible]

[illegible]

[illegible] (-)


N层
M层
L层
K层
原子核



+1 1
H
+2 2
He
+3 2 1
Li
+4 2 2
Be
+5 2 3
B
+6 2 4
C
+7 2 5
N
+8 2 6
O
+9 2 7
F
+10 2 8
Ne
+11 281
Na
+12 282
Mg
+13 283
Al
+14 284
Si
+15 285
P
+16 286
S
+17 287
Cl
+18 288
Ar

[illegible]

1 [illegible] [illegible] [illegible] **CD**

A [illegible] 2 [illegible] 8 [illegible] 8 [illegible]

B [illegible]

C [illegible] F^- [illegible] Na^+ [illegible] Mg^{2+} [illegible] Al^{3+} [illegible] Ne [illegible]

D [illegible] NH_4^+ [illegible] H_3O^+ [illegible]

[illegible]

1 [illegible]

[illegible]

能层	一	二	三	四	五	六	七	……
符号	K	L	M	N	O	P	Q	……
最多电子数	2	8	18	32	50	……		

2 □□□□

□□□□□□□□□□□□□□□□□□□□□□□□□

□□□

□□□□□□□□□□□□□□□□□□

能层	K	L		M			N				O		
能级	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f	5s	5p	……
最多电子数	2	2	6	2	6	10	2	6	10	14	2	6	……

□□□□□□□□ P_5 [□□□]

[illegible]

① [illegible]; [illegible] s [illegible]

② [illegible] $2n^2$ [illegible];

[illegible] s [illegible] p [illegible] d [illegible] f…… [illegible] 1 [illegible] 3 [illegible] 5 [illegible] 7…… [illegible]

③ [illegible]

1s [illegible] 2s [illegible] 3s [illegible] 4s [illegible] …… 2p [illegible] 3p [illegible] 4p [illegible] 5p [illegible] ……

[illegible] ns [illegible] np [illegible] nd [illegible] nf [illegible] ……

[illegible]

[illegible](n)	[illegible]	[illegible]		[illegible]			[illegible]				[illegible]	[illegible]	[illegible]
[illegible]	K	L		M			N				O	P	Q
[illegible](l)	1s	2s	2p	3s	3p	3d	4s	4p	4d	4f	......		
[illegible]	2	2	6	2	6	10	2	6	10	14	......		
	2	8		18			32				$2n^2$		

□□□□

1 □□□□□□□□□□□□ □ **A D**

A □ 6s B □ 2d C □ 3f D □ 7p

2 □□ *n*=3 □□□□□□□□□□□□ □ **B**

A □ *n* p B □ *n* f C □ *n* d D □ *n* s

3 □□□□□□□□□□□□□□ d □□□□□ □ **CD**

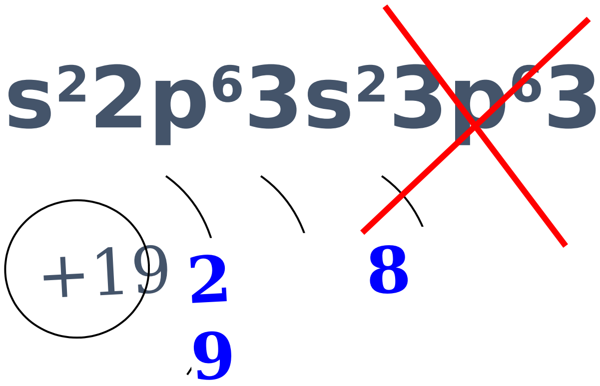
A □ N □□ B □ M □□

C □ L □□ D □ K □□

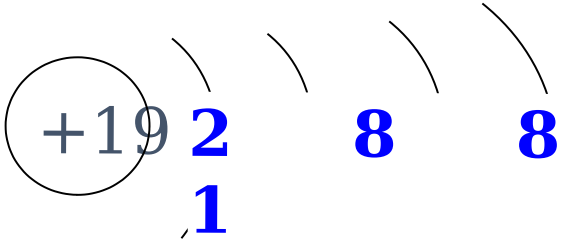
[illegible] [illegible] K [illegible]

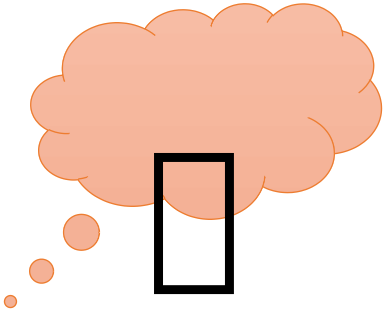
[illegible]

[illegible] $1s^22s^22p^63s^23p^63d^1$



[illegible]

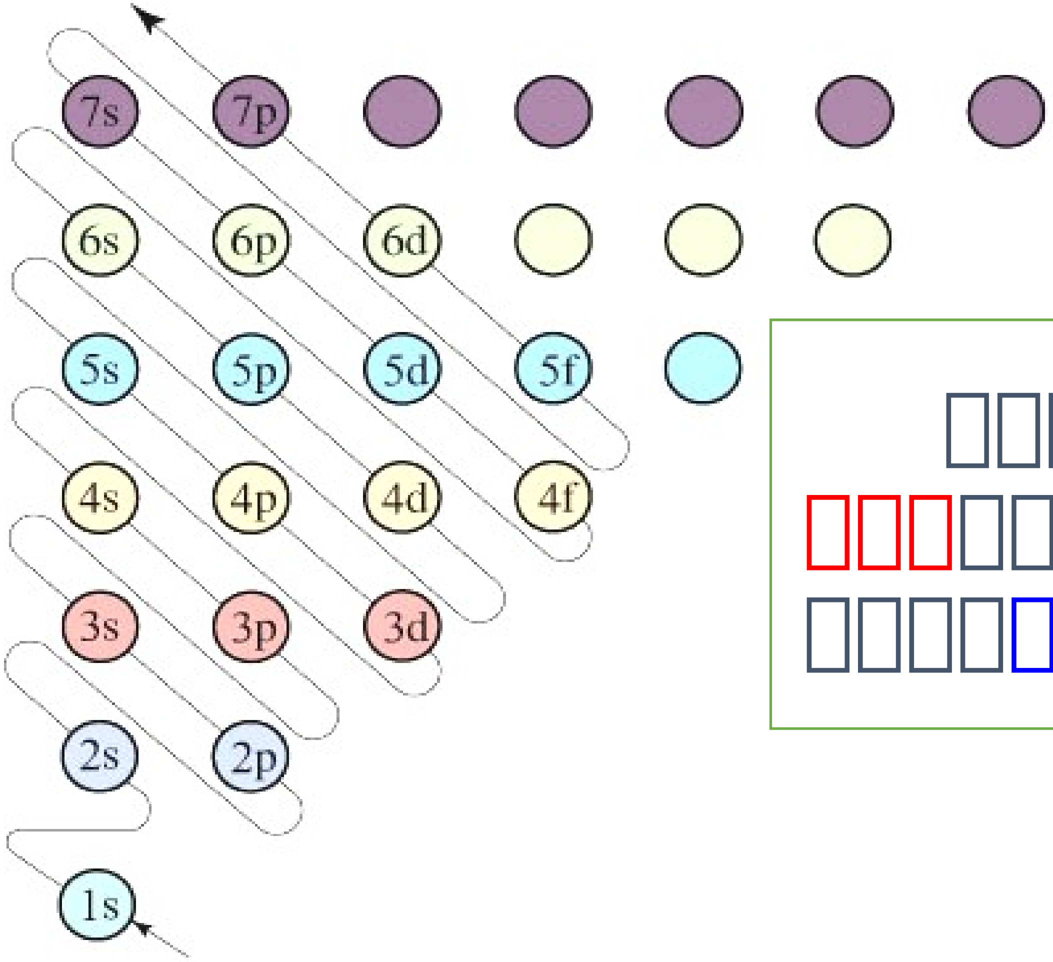




$1s^22s^22p^63s^23p^64s^1$

[illegible]

1 [illegible]

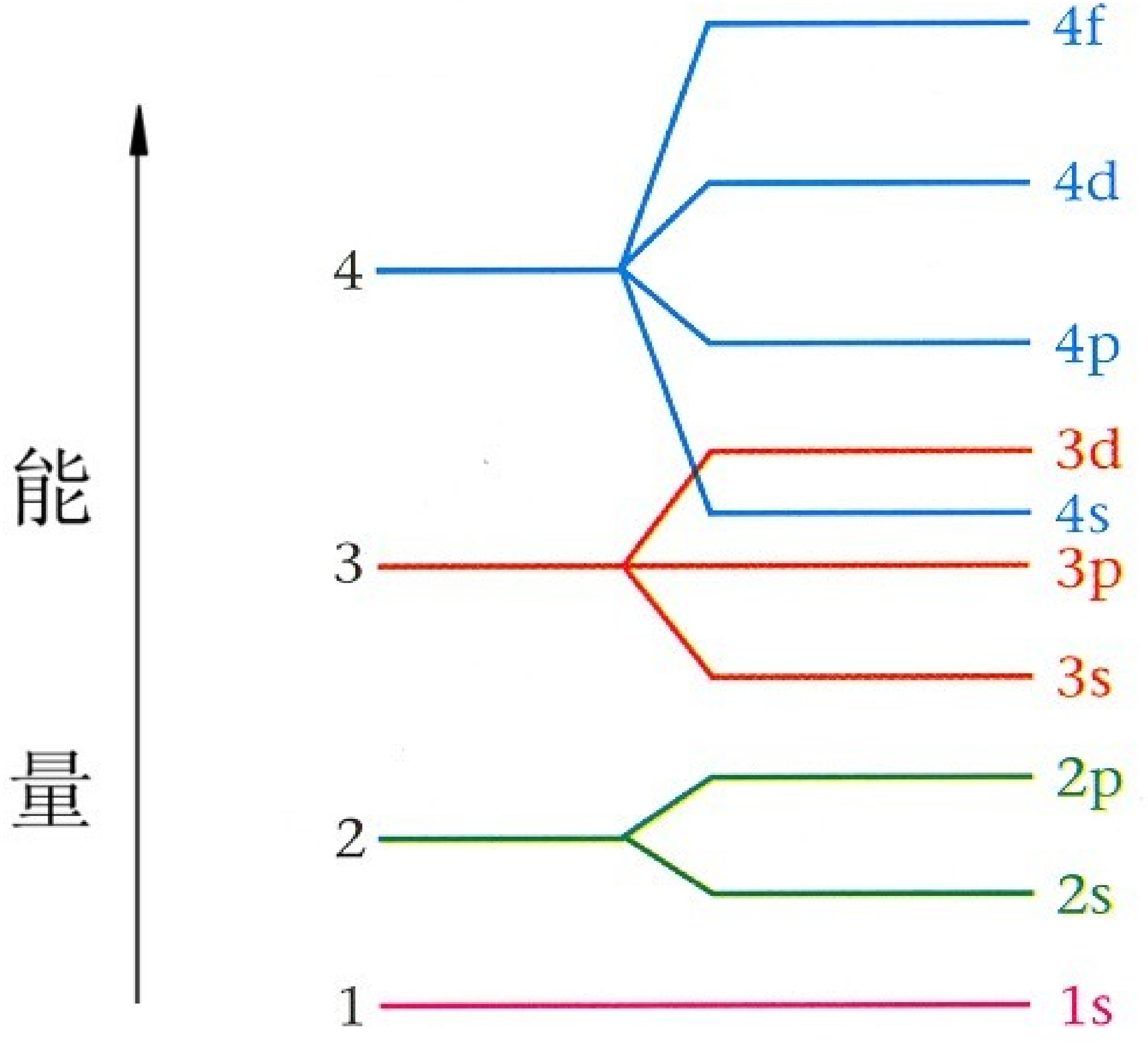


[illegible]

□□□□□ 1*s*□<u>2*s* 2*p*</u>□<u>3*s* 3*p*</u>□<u>4*s* 3*d* 4*p*</u>□
□□ <u>5*s* 4*d* 5*p*</u>; <u>6*s* 4*f* 5*d* 6*p*</u>□<u>7*s* 5*f* 6*d* 7*p*</u>

□□□ns□(n-2)f□(n-1)d□np

□□: ns < (n-2)f < (n-1)d < np (n□□□□□)

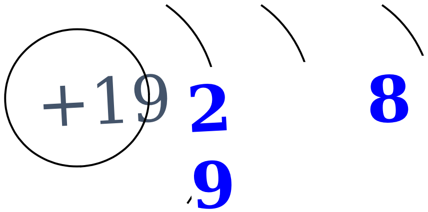


E(3d)>E(4s)

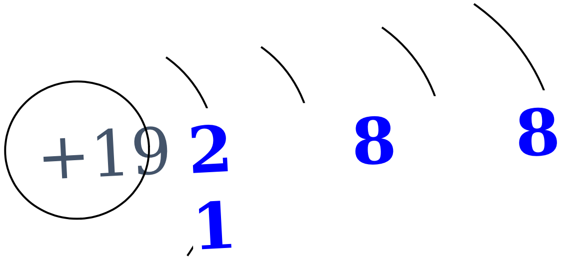
[illegible]

K [illegible]

[illegible] $1s^22s^22p^63s^23p^63d^1$



[illegible] $1s^22s^22p^63s^23p^64s^1$



2. [illegible]

[illegible]

[illegible]

[illegible]

Na [illegible] $1s^2 2s^2 2p^6 3s^1$

K L M

Fe [illegible]

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$

K L M N

[illegible]

[illegible]

1. C [illegible] O [illegible] Si [illegible] S

2. $_{21}Sc$ [illegible] $_{25}Mn$ [illegible] $_{27}Co$ [illegible] $_{35}Br$

[illegible]

[illegible]

$_{26}Fe$ [illegible] ______________________ $[Ar]3d^6 4s^2$

$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$ [illegible]

Fe^{2+} [illegible] Fe^{3+} [illegible]

[illegible]

Fe^{2+} [illegible] $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$ [illegible]

$[Ar]3d^6$ [illegible]

Fe^{3+} [illegible] $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$ [illegible]

$[Ar]3d^5$ [illegible]

[illegible]

$_{24}Cr$ [illegible] $1s^22s^22p^63s^23p^63d^54s^1$

$_{29}Cu$ [illegible] $1s^22s^22p^63s^23p^63d^{10}4s^1$

p [illegible] **d** [illegible] **f** [illegible]

[illegible]

1. [illegible] $1s^22s^22p^63s^23p^6$

[illegible] ______________

18

2. [illegible] $3s^23p^4$, [illegible]

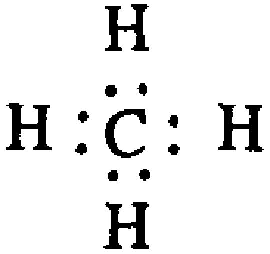
[illegible] ______________

[illegible] 3 [illegible] VIA [illegible]

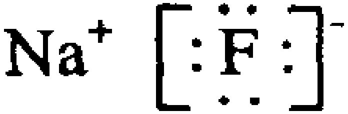
[illegible]

3. [illegible] (　　　) **C**

A. [illegible]



B. [illegible]



C. [illegible]　$1s^22s^22p^63s^23p^4$

D. [illegible] 12 [illegible]　$^{12}_{6}C$

[illegible]

1 [illegible]

[illegible]

2 [illegible]

[illegible]

3 [illegible]

[illegible] ⇌ [illegible]

[illegible] [illegible]

[illegible]

① [illegible]

② [illegible]

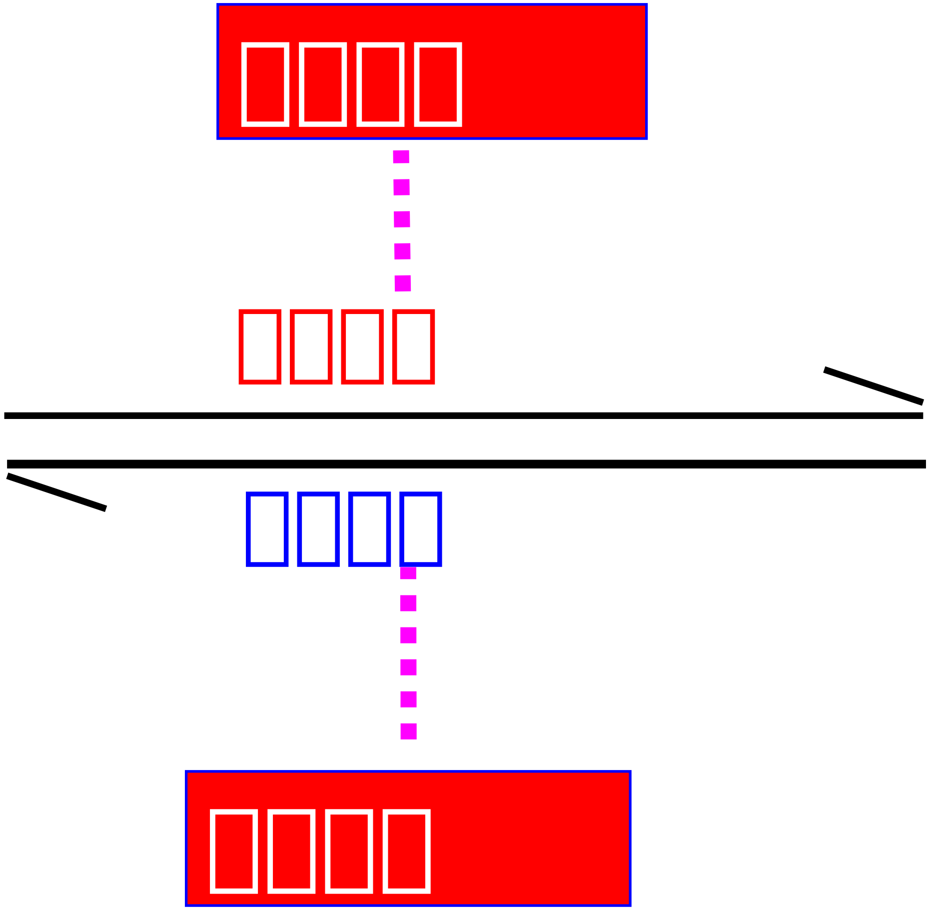
> [illegible]

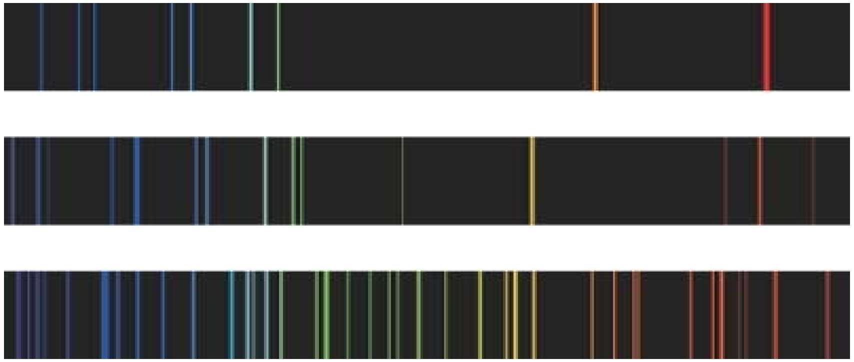
激光源

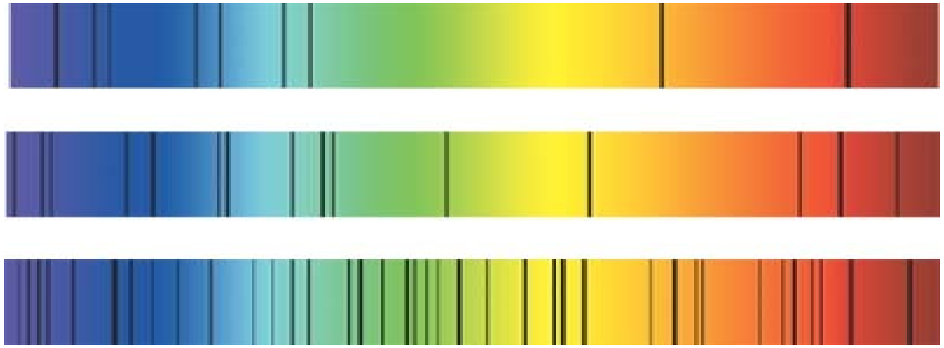
夜空中的激光

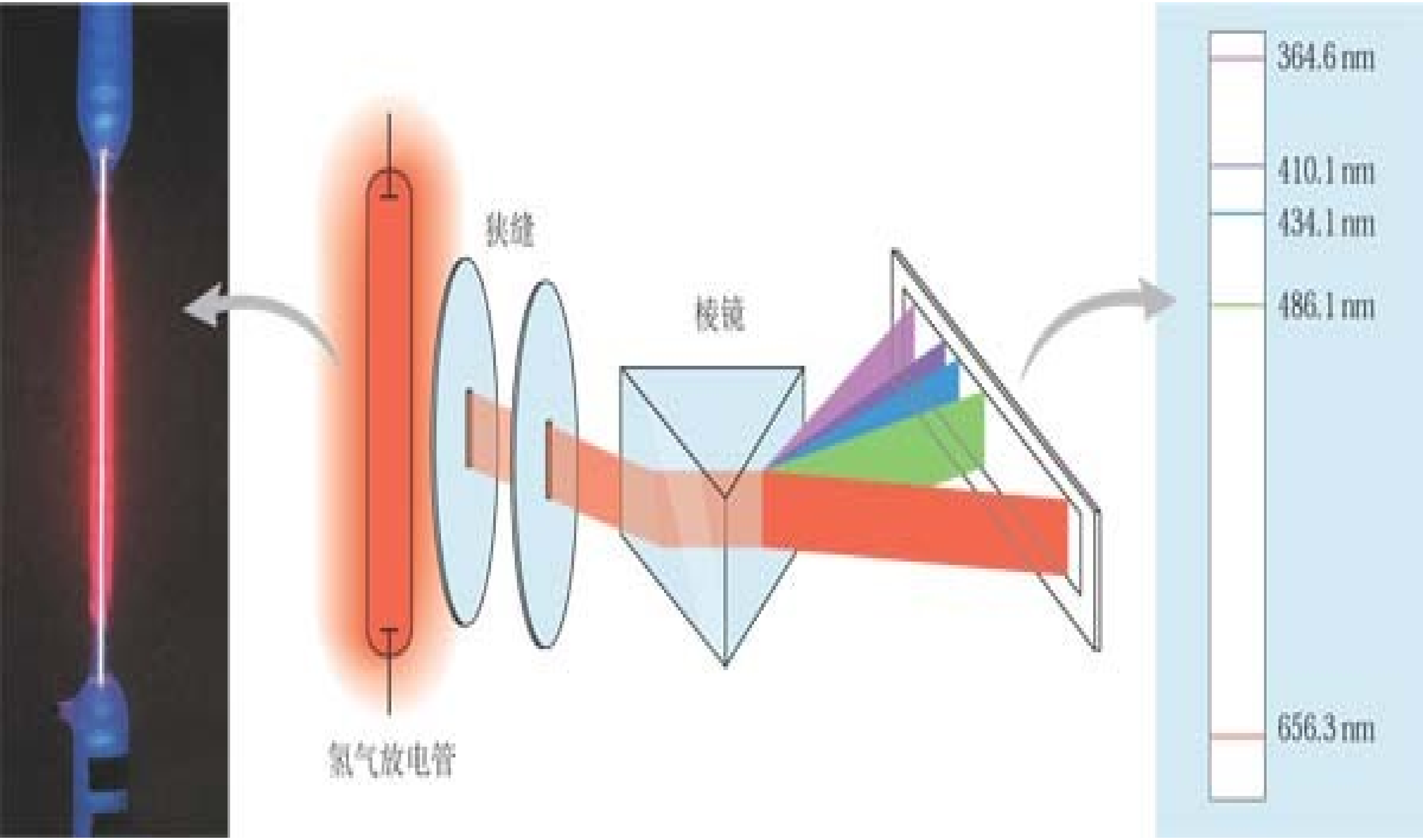
4

1








狭缝
棱镜
氢气放电管
364.6 nm
410.1 nm
434.1 nm
486.1 nm
656.3 nm

[illegible]

1. [illegible] $1s^2 2s^2 2p^6 3s^2 \rightarrow 1s^2 2s^2 2p^6 3p^2$ [illegible]

[illegible] [illegible]　　　**A**

A [illegible]

B [illegible]

C [illegible]

D [illegible]

2. □□□□□□□□□□□□□□

(1) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$ □□□□□

(2) $1s^2 2s^2 2p^6 3d^1$ □□□□□

□□□□□ 1s □ 2s 2p □ 3s 3p □ 4s 3d 4p □ 5s 4d 5p; 6s 4f 5d 6p □ 7s 5f 6d 7p

[illegible]

[illegible]

[illegible]

- [illegible]
- [illegible]

[illegible]

[illegible] ([illegible] 9.11×10^{-31} kg) [illegible]

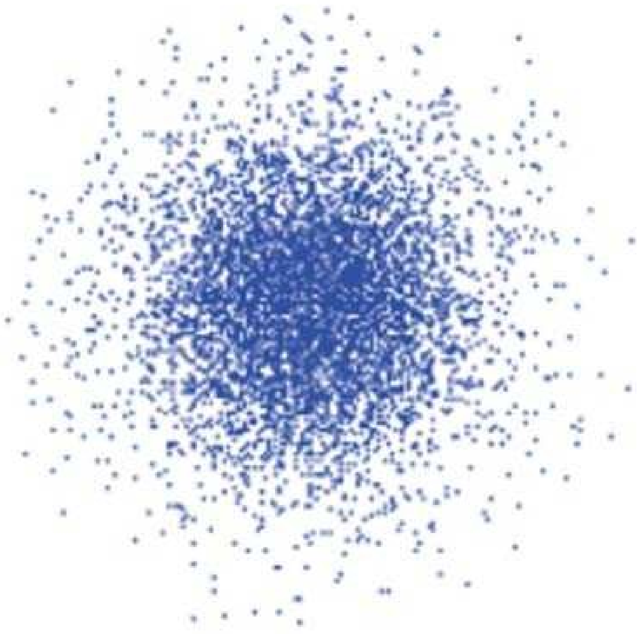
[illegible] ([illegible]) [illegible]

[illegible]

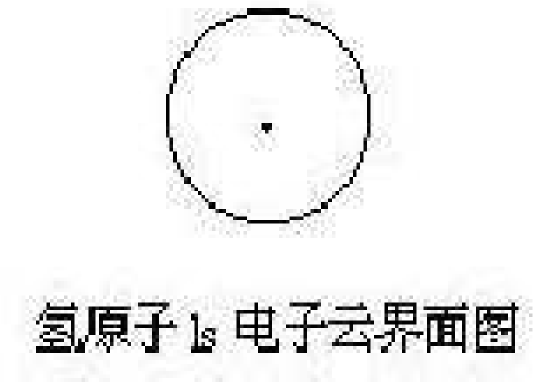
[illegible]

[illegible] ([illegible]) [illegible]

[illegible] ([illegible])

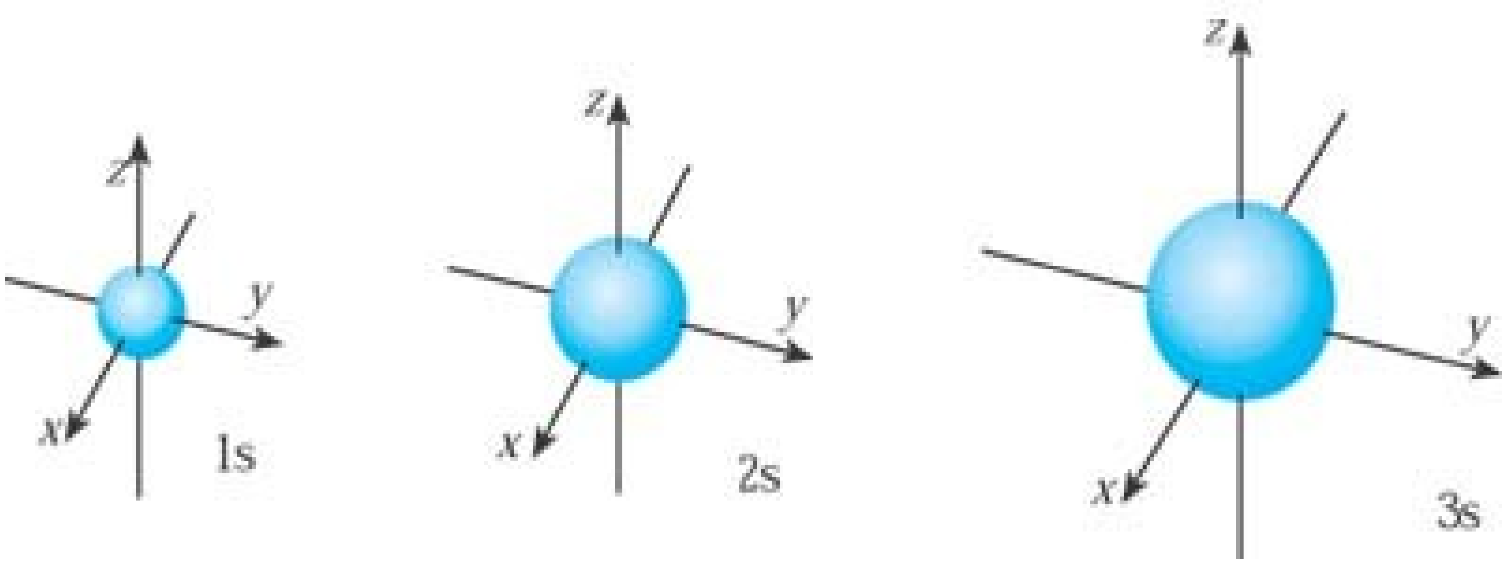


p_{10}



90%

ns [illegible] 1 [illegible]



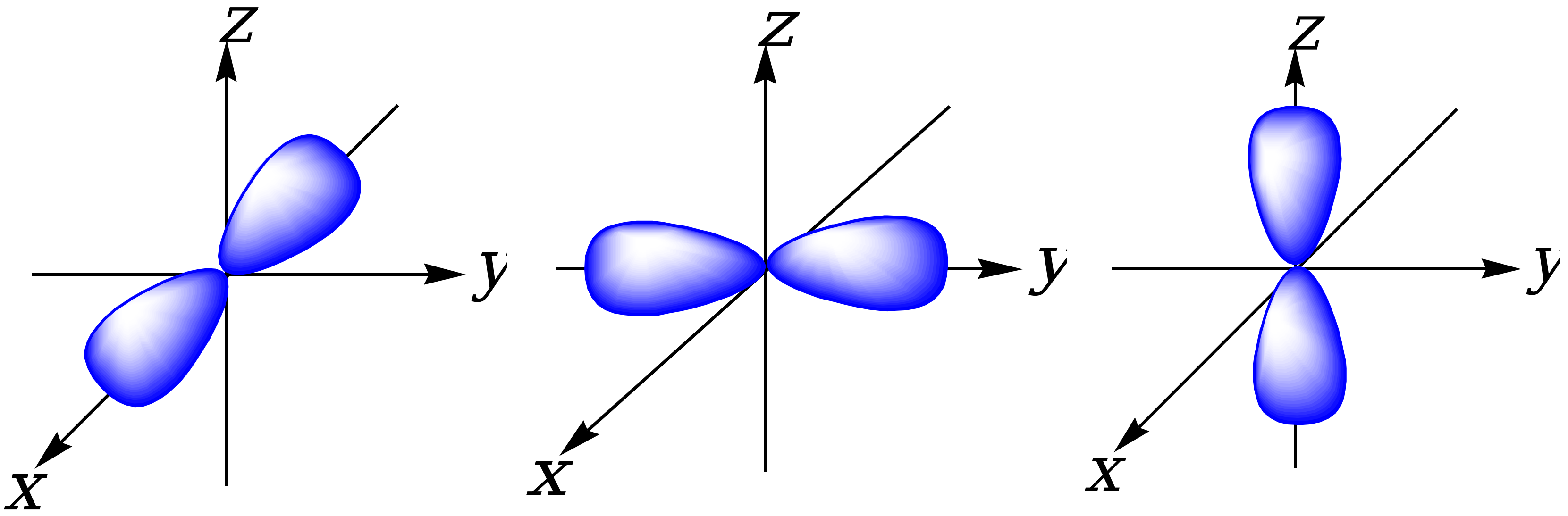
s [illegible]

[illegible]

S [illegible] n [illegible]

[illegible] 1s<2s<3s…… [illegible]

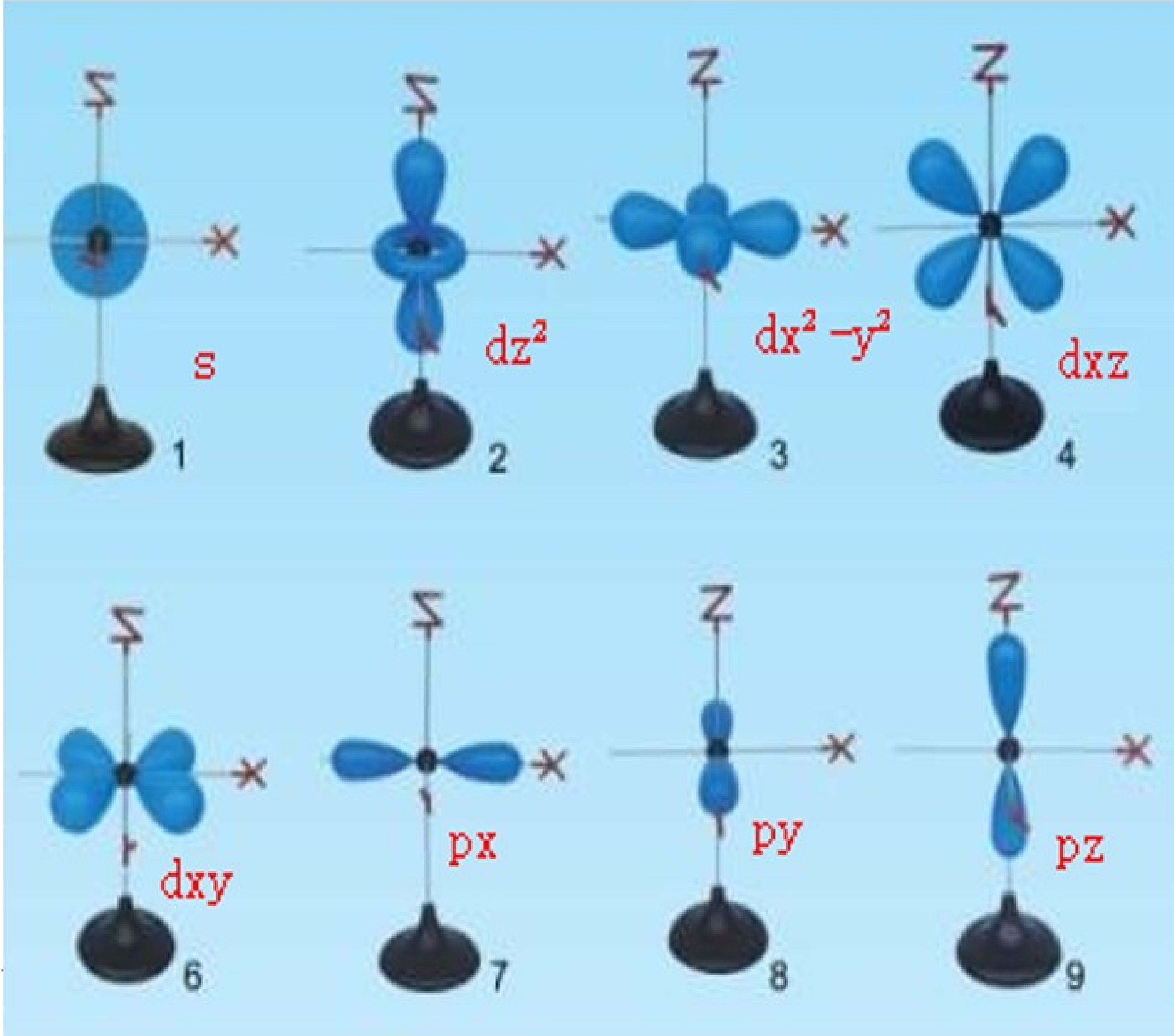
np [illegible] 3 [illegible]



P [illegible] [illegible]

[illegible] **P** [illegible] **3** [illegible] **:** **P_x** [illegible] **P_y** [illegible] **P_z** [illegible]

[illegible] **P_x** [illegible] **P_y** [illegible] **P_z** [illegible] [illegible]



S电子云
（球形）

P电子云
（哑铃形或纺锤形）

[illegible]

[illegible]1[illegible]ns[illegible]1[illegible]

[illegible]2[illegible]np[illegible]3[illegible]

[illegible]3[illegible]nd[illegible]5[illegible]

[illegible]4[illegible]nf[illegible]7[illegible]

[illegible]

[illegible]s[illegible]p[illegible]d[illegible]f……[illegible]

[illegible]1[illegible]3[illegible]5[illegible]7……[illegible]

[illegible]

1 [illegible]

① [illegible]②[illegible]③[illegible]

[illegible] 2 [illegible]<u>[illegible]</u>

[illegible]

2 [illegible]

[illegible] Al [illegible] V [illegible]

□□□□□□□

□□□□□□□□□□ p^6 □ d^{10} □ f^{14} □□□□□ p^3 □ d^5 □ f^7 □□ □□□ (p^0,d^0,f^0) □□□□□□□□□□□□□□□□□□□

□□□□□ $_{24}Cr$ □ $_{29}Cu$ □□□□□□□□□□□□

□□□□□□□

$_{24}Cr$ $1s^22s^22p^63s^23p^63d^5$ $4s^1$

[Ar] $3d^54s^1$

$_{29}Cu$ $1s^22s^22p^63s^23p^63d^{10}$ $4s^1$

[Ar] $3d^{10}4s^1$

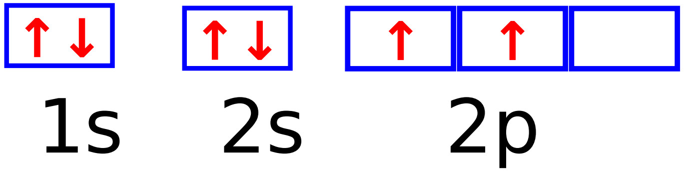
①

②

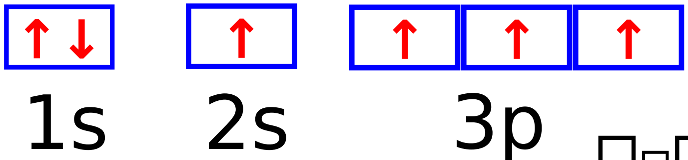
③

④

1. [illegible]



[illegible]



[illegible]（ ） **A C**

A. [illegible]

B. [illegible]

C. [illegible]

D. [illegible]

2 [illegible]（ ）[illegible]

CD

A. [illegible] 3s [illegible] 3p [illegible]

B. [illegible] 2s [illegible] 5s [illegible]

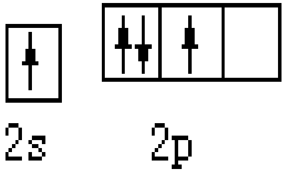
C. p [illegible] p [illegible]
[illegible]

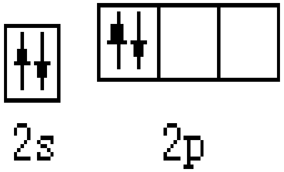
D. [illegible] n [illegible] 4 [illegible] 16 [illegible]

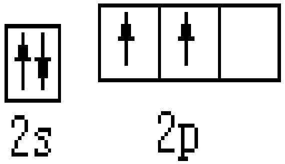
3 [illegible]

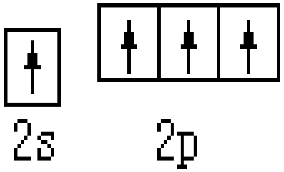
[illegible] （ ）

C









A **B** **C** **D**

4 [illegible] **24** [illegible]

(1) [illegible]

$1s^2\ 2s^2 2p^6\ 3s^2 3p^6 3d^5\ 4s^1$

(2) [illegible] ____ [illegible] 4 [illegible] ______ [illegible] 7 ____ [illegible] 15 ______ [illegible] 24 [illegible]

(3) [illegible] ____ 6 [illegible]

______ [illegible] 6

5 □□□□□□□□

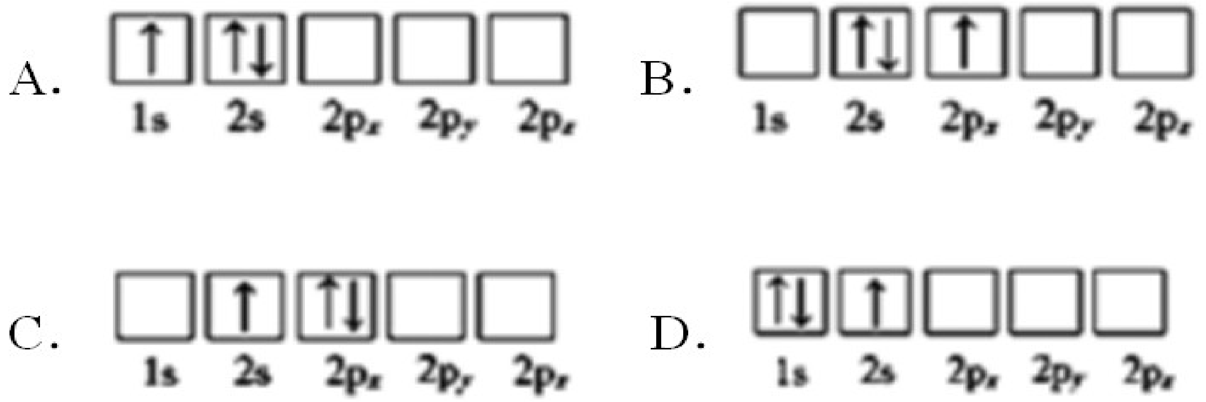
□2020 □□□ I □35.□1 □□□ Fe^{2+} □ Fe^{3+} □□□□□□□□□□
□□□ __________ □ 4:5

□2020 □□□ II □□ 1 □□□ Ti □□□□□□□□□□
$1s^22s^22p^63s^23p^63d^24s^2$

□2019 □□ II □35.□2 □ Fe □□□□□□□□□ ______ □ 4s □□□
□ Sm □□□□□□□□□ $4f^66s^2$ □ Sm^{3+} □□□□□□□□
$4f^5$ □

□2019 □□ III □35.□1 □□□□□□□ Li □□□□□□□□□□□□□
□ __________ □□□□□□□□ Mg □ M □□□□□□□□□ __________ □□“□
□”□“□□”□□ 相反

□2018□□I□35.□1□□□Li□□□□□□□□□□□□□□□□□□□□□□□□□□□□ (□□□)□ D□ C



□2018□□II□35.□1□□□Fe□□□□□□□□□□□□□□(□□□□□)□

____________□□□ □□□□□□□□□□□□□□□□

____________□□ □□(□□□)

□2018□□III□35.□1□Zn□□□□□□□□□□□

$[Ar]3d^{10}4s^2$ □

6. [illegible] 21—36 [illegible]

Sc $1s^22s^22p^63s^23p^63d^14s^2$

Ti $1s^22s^22p^63s^23p^63d^24s^2$

V $1s^22s^22p^63s^23p^63d^34s^2$

Cr $1s^22s^22p^63s^23p^63d^54s^1$

Mn $1s^22s^22p^63s^23p^63d^54s^2$

Fe $1s^22s^22p^63s^23p^63d^64s^2$

Co $1s^22s^22p^63s^23p^63d^74s^2$

Ni $1s^22s^22p^63s^23p^63d^84s^2$

Cu $1s^22s^22p^63s^23p^63d^{10}4s^1$

Zn $1s^22s^22p^63s^23p^63d^{10}4s^2$

Ga $1s^22s^22p^63s^23p^63d^{10}4s^24p^1$

Ge $1s^22s^22p^63s^23p^63d^{10}4s^24p^2$

As $1s^22s^22p^63s^23p^63d^{10}4s^24p^3$

Se $1s^22s^22p^63s^23p^63d^{10}4s^24p^4$

Br $1s^22s^22p^63s^23p^63d^{10}4s^24p^5$

Kr $1s^22s^22p^63s^23p^63d^{10}4s^24p^6$